CLAIMS

1. A proton exchange membrane comprising a perfluorosulfonic acid having silica particles embedded therein in a concentration comprised between 0.01 and 50% by weight and dimensions comprised between 0.001 and 10 micrometers, characterized in that said membrane comprises both an amorphous and a crystalline phase and the ratio thereof is adjusted by means of a controlled thermal treatment at a temperature higher than the glass transition temperature.

2. The membrane of claim 1 wherein said thermal treatment is controlled by an X-ray diffraction spectrometer.

3. The membrane of claim 1, wherein said crystalline phase represents 25% of the amorphous phase.

4. A method for operating a membrane electrochemical cell where oxidation of a fuel selected in the group comprising methanol, ethanol, hydrogen coming from the processing of hydrocarbons or alcohols occurs at the anode compartment, characterized in that it comprises using the membrane of claims 1 or 2 at a temperature above 100°C.

5. The method of claim 4 characterized in that said fuels are fed at a temperature below 100°C.

6. The method of claims 4 or 5 characterized in that said hydrogen coming from the processing of hydrocarbons or alcohols contains more than 10 ppm of carbon monoxide.

7. The method of claims 4, 5 or 6 characterized in that said cell is a fuel cell.

8. A membrane electrochemical cell where oxidation of a fuel selected in the group comprising methanol, ethanol, hydrogen coming from the processing of hydrocarbons or alcohols occurs at the anode compartment characterized in that it comprises the membrane of claims 1 or 2 and said cell operates at a temperature above 100°C.

9. The cell of claim 8 characterized in that said hydrogen coming from the processing of hydrocarbons or alcohols contains more than 10 ppm of carbon monoxide.

10. The cell of claims 8 or 9 characterized in that said fuels are fed at a temperature below 100°C.

11. The cell of claims 8, 9 or 10 characterized in that it is a fuel cell.

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